

**Key Outcomes Memorandum**  
for the  
**California Bay-Delta Authority Independent Science Board Meeting**  
Convened February 22-23, 2005  
Sacramento, California

To: ISB Members

From: Tom Dunne (Chair) and Denise Reed (Vice Chair), ISB

Through: Johnnie Moore, CBDA Science Program

Re: Key Outcomes of the February 22 – 23, 2005 ISB Meeting

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This Key Outcomes Memorandum provides an overview of the discussions and action items resulting from the Independent Science Board (ISB) meeting held on February 22<sup>nd</sup> and 23<sup>rd</sup>, 2005. The first five pages of the memo focus on key outcomes from the meeting followed by the ISB's current 2005 Work Plan. The remainder of the package provides a more detailed summary of the meeting.

### **2005 ISB Work Plan**

The 2005 Work Plan was updated to reflect reports from subcommittees and fact finding teams, board discussions during the meeting, and a request from the Lead Scientist for ISB review of a draft Science Agenda (distributed at the meeting). Several additional fact finding teams were formed to implement elements of the Work Plan. An updated Work Plan and associated assignments matrix is attached to this key outcomes memo. Topics and key outcomes presented below are organized in accordance with the 2005 Work Plan.

### **Delta Improvements Package (DIP)**

ISB discussion about DIP touched upon the need for science to have a “systems perspective” that considers the integration of multiple scientific disciplines and perspectives. Future investigations should look at long-term risks and challenges associated with DIP actions, including landscape-scale processes that might affect levee stability, water quality (other than salinity and total organic carbon), urbanization, and climate change. The ISB will identify and appraise sources of information relative to the DIP (as outlined in its 2005 Work Plan) once the environmental documents for the DIP have been released.

Two ISB fact finding teams reported back to the ISB on DIP-related topics:

1. *Water Supply Management* (Luoma, Freyberg)

The ISB Water Supply Team submitted a draft memorandum to the ISB, recommending possible research questions related to the DIP that might be investigated by the Water Management Science Board (WMSB), ISB, agencies, or other interested parties. Based on feedback received from the ISB and members of the WMSB (Keller, Melack, Ingram) at the meeting, the memorandum will be revised and submitted to the WMSB. The ISB will work collaboratively with the WMSB as well as the Ecosystem Restoration Program Science Board

(ERPSB) to investigate a number of the questions and to explore the scope of issues necessary to fully evaluate changes in water delivery and flow characteristics as they relate to water quality and ecosystem processes.

**Action Items:**

- Luoma and Freyberg to revise ISB memorandum and transmit to Dunne (ISB Chair) for submission to the WMSB prior to the next ISB meeting.
- ISB to consider publicizing the list of questions identified in the memorandum in the CALFED on-line journal to stimulate broader discussion.

2. *Modeling* (Melack)

Melack attended the California Water and Environment Modeling Forum (CWEMF) Annual Meeting at Asilomar on March 1-4, 2005 and provided a presentation at the Asilomar Meeting on the ISB's interest in hosting a modeling workshop in collaboration with CWEMF to explore the use of models for addressing scientific questions related to the DIP.

**Action Item:** ISB member Rose was appointed by Dunne to work with Melack on additional fact finding and planning with CWEMF for a workshop in Fall 2005 on modeling and the DIP.

The ISB will identify and appraise sources of information relative to the DIP (as outlined in its 2005 Work Plan) once the environmental documents for the DIP have been released.

**Lead Scientist/Authority Requests: ISB Review of Science Agenda**

The ISB discussed their role in the development and review of the CBDA Science Agenda as proposed by the Lead Scientist (see meeting handout entitled 'Developing the Science Program Research Agenda'). The ISB suggested that the Lead Scientist consider two distinct aspects in developing the Science Agenda: 1) original work, or *research*, and 2) efforts to communicate science findings, or *information transfer*.

Two ISB teams were formed to work with the Lead Scientist to refine the Science Agenda: Information Transfer Team (Adams, Twiss) and Research Team (Glaze, Meyer).

The ISB also identified the need to consider strategies for the ISB and the Science Agenda to get beyond a short-term perspective and to consider some of the broader, longer-term science issues facing the program. The ISB agreed to plan for a more substantive discussion of this issue at the May meeting.

**Action Items:**

- Review and provide comments to the Lead Scientist on the document entitled 'Developing the Science Program Research Agenda' (all ISB members).
- Prepare for ISB discussion in May regarding strategies to ensure the ISB does not lose sight of broader, long-term issues (Glaze, Dunne).

**Assessing Science Needs**

Triggered by the Lead Scientist's summary of the Science Program PSP, the ISB offered the following observations regarding the use of PSPs for addressing science needs:

- State contracting process have a detrimental effect on the Program's ability to mobilize scientific studies in a timely manner to respond to the needs of management agencies.
- Relevant and promising, but unfunded proposals from the Science Program PSP might be shared with other CALFED programs.
- Are there different approaches the Science Program might consider, beyond the PSP process, for funding science activities?

**Action Item:** A fact-finding team (Adams, Reed) was appointed by Dunne to consider the issues noted above and to formulate recommendations regarding the PSP process based on the experience gained in the administration of the current process.

### **System Monitoring and Data Assimilation**

The ISB continues to explore the utility of monitoring and data management, combined with modeling for the purposes of:

- Real time operational decisions
- Projections of future consequences of specific actions
- Predictions of the long-term behavior of the Bay-Delta system

The Monitoring Team (Glaze, Meyer) delivered its Progress Report, including recommendations for:

- A possible forum in Fall 2005 building on Comprehensive Monitoring Assessment and Research Program (CMARP) and Terrestrial and Amphibian Monitoring Program (TAMP) progress, to explore monitoring and data assimilation further
- A technical panel to explore a Data Assimilation (Observation and Forecasting) System to assess CALFED program performance.

The ISB has been examining whether there are opportunities for improving monitoring, data storage and access, and data assimilation for the entire Bay-Delta system. A data assimilation system is a means of organizing data collection and of using models for evaluating and interpolating sparse measurements , and for forecasting on the basis of the accumulating record. The Board has been briefed about such a system that operates in the Columbia River estuary, and the Board continues to investigate the status of monitoring in the California Bay-Delta. In order to evaluate how useful a monitoring and data assimilation might be for particular applications in the CALFED system the Board agreed to learn about two management problems for which such a system might be useful. These cases are: salt management in the San Joaquin River and the future operation of South Delta Barriers. The Board will be taking advice from agency personnel involved in these issues in the coming months. The fact-finding teams established to investigate these topics are:

- Permanent operable South Delta Barriers - May 2005 (Freyberg, Mount)
- Salt management in the San Joaquin River - September 2005 (Luoma, North)
- Members decided that “working sessions” should be built into the May and September ISB meeting to explore the use of monitoring and data assimilation to address specific DIP-related management and policy questions as examples of what might be accomplished with monitoring and data assimilation.

### **Action Items:**

- Before the May meeting, the South Delta Barriers Team will review the experience of how monitoring and data assimilation have been used in the installation and maintenance of temporary barriers, as well as what plans already exist a data assimilation system in the design and operation of the new permanent barriers. The Team will convene a working session at the May ISB meeting to explore the potential use of a monitoring and data assimilation system to support operation of the new barrier and will recommend agency personnel who might brief a working session at the May Board meeting.

- The ISB, led by the San Joaquin River Salt Management Team (Luoma, North), will work with Bob Spies (ERPSB) investigate the topic and a similar work session at the September Board meeting.
- The ISB will explore the formation of a technical panel to evaluate potential for an integrated observation and data assimilation system for the Bay-Delta and its watershed following the work sessions.
- Alert the Authority in April to ISB plans for the exploration of a Monitoring and Data Assimilation System.

### **Integrated Use of Environmental Water (EWA/ERP Integration)**

Patten (Chair) reported that the February 21 Subcommittee meeting was cancelled due to illness and travel problems.

#### **Action Items:**

- Convene a Subcommittee meeting via conference call to discuss findings and finalize work product.
- Produce a final subcommittee report on EWA/ERP Integration before the next ISB Meeting.

### **Levees**

Ingram (Chair) reported on principal activities since the November 2004 ISB meeting:

- Review of the “scouting” report from Mount and Twiss.
- January 2005 Levees Subcommittee meeting, which drew substantial interest from stakeholders who attended by phone and in person.

Key issues-of-concern considered by the Subcommittee included:

- Risk Assessment..
- Cost-Benefit Analysis.
- Subsidence Management..
- Peer Review and Publication of Results.
- Review of Policies..

The Subcommittee intends to gain more background on current approaches to assessing potential levee failure, before it formulates recommendations to the ISB. They will focus on improving their understanding of current studies (e.g., seismicity and risk analysis) and on clarifying connections between the Levee Integrity Program and other CALFED Programs. It was suggested that the Levees Subcommittee consider seeking assistance from the WMSB.

#### **Action Items:**

- Subcommittee to conduct additional fact-finding and meet before the May ISB meeting to prepare specific recommendations for ISB approval.

## **Performance Measures**

The PM Subcommittee is focusing on developing guidelines for evaluating performance measures for CALFED programs. The Subcommittee plans to review existing performance measures proposed by various programs and make observations and recommendations based on this review. They will examine whether existing measurement schemes are appropriate for evaluation of CALFED programs by considering how the schemes could be used for evaluating progress of the Water Quality Program and the Science Program.

### **Action Items:**

- Conduct fact finding to understand status of existing performance measures and their relationship to goals and objectives
- Develop guidelines to guide assessment of performance measures
- Test methodology relative to: (1) Science Program, and (2) Water Quality Program

## **Possible Agenda for May 10–12, 2005 ISB Meeting**

- Brown bag presentation on existing monitoring and data assimilation programs in the California Bay-Delta.
- Monitoring and data assimilation work session—applicability to the design and operation of South Delta Barriers.
- Update on 2005 Science Program post-doc and assistantship positions.
- Subcommittee Meetings and Updates.
- Optional field trip to the San Joaquin River.

The Chair and Vice-Chair will work to further develop the agenda.

## **Future ISB 2005 Meeting Dates:**

September 20–22 (Tuesday – Thursday)

December 5–6 (Monday – Tuesday)

**ISB 2005 Workplan (as updated at February 2005 ISB Meeting)**

<b>Topic</b>	<b>Planned Activity</b>	<b>Timeframe for Completion</b>	<b>Action Product<sup>1</sup></b>
<b>Delta Improvements Package</b>  <b>Continuing activity – 2005 activities focus on two questions.</b>	<b>What science is currently being used to support decision-making and what could be used, both in the short-term and the long-term?</b>  <b>Current</b> <ul style="list-style-type: none"> <li>Identify and appraise sources of information, e.g., IEP, draft EIS/EIR</li> <li>Work with WMSB &amp; ERPSB to explore the scope of issues necessary to fully evaluate changes in water delivery and flow characteristics.</li> </ul> <b>Future</b> <ul style="list-style-type: none"> <li>Work with CWEMF to plan workshop (Fall 2005) to explore use of modeling in determining the role in inc. pumping rates in allow more flexible approaches to water quality management and ecosystem restoration.</li> </ul>	Initial eval. May 2005 Continue throughout EIS/EIR process  Initial report September 2005  December 2005	Commentary  Original Approach  Original approach
<b>Lead Scientist/Authority Requests</b>  ISB Review of Science Agenda	<ul style="list-style-type: none"> <li>Review and refine draft Science Agenda. <ul style="list-style-type: none"> <li>Research</li> <li>Information Transfer</li> </ul> </li> </ul>	Spring 2005.	TBD

<sup>1</sup> Actions/products identified under the "Planned Activity" column in the table refer to specific deliverables as defined in the draft Operating Guidelines for the ISB. Abbreviated definitions for these six types of activities are provided at the end of table.

Topic	Planned Activity	Timeframe for Completion	Action Product <sup>1</sup>
<b>System Monitoring and Data Assimilation</b>	<ul style="list-style-type: none"> <li>Survey existing monitoring programs and assess their utility in addressing selected hypotheses underlying the program.</li> <li>Explore use of monitoring and data assimilation to address specific management and policy questions regarding: <ul style="list-style-type: none"> <li>Permanent operable South Delta Barriers</li> <li>Salt management in San Joaquin</li> </ul> </li> <li>Explore the formation of technical panel to evaluate potential for an integrated observation and data assimilation system for the Bay-Delta and its watershed.</li> </ul>	February 2005 – <b>Completed</b>  May 2005 Working session Sept. 2005 Working session  Fall 2005	Original approach
<b>Assessing Science Needs</b>	<ul style="list-style-type: none"> <li>Evaluate PSP approach as a tool for addressing the scientific needs of the Bay-Delta Program <ul style="list-style-type: none"> <li>Other programs funding proposals</li> <li>Contracting challenges</li> <li>Science timeline vs. decision timeline</li> </ul> </li> </ul>	May 2005 interim report September 2005	
<b>Integrated Use of Environmental Water</b>	<ul style="list-style-type: none"> <li>Subcommittee to begin evaluation of use of current resources including EWP, EWA, CVPIA b2 &amp; b3 water</li> </ul>	Update May 2005	Commentary
<b>ISB Annual Report</b>	<ul style="list-style-type: none"> <li>Prepare annual report summarizing 2004/5 activity of ISB.</li> </ul>	Draft September 2005 Final December 2005	Original Approach
<b>Levees</b>	<ul style="list-style-type: none"> <li>Subcommittee to prepare ISB recommendation based on work of Mount/Twiss/Keller and additional fact-finding.</li> </ul>	May 2005	Original approach
<b>Performance Measures</b>	<ul style="list-style-type: none"> <li>Conduct fact finding to understand status of PM and their relationship to goals and objectives</li> <li>Develop standardized methodology to guide assessment of performance measures</li> <li>Finalize methodology</li> <li>Recommend performance measures for: <ul style="list-style-type: none"> <li>Science Program</li> <li>Water Quality Program</li> </ul> </li> </ul>	May 2005 report on status  Draft May 2005  September 2005 September 2005	Briefing  Original approach  Original approach

#### **Actions/Products**

**Consultation:** Oral advice on a technical issue prior to having staff begin substantive work on that issue.

**Advisory:** Written advice on technical works-in-progress.

**Review:** Assessment on the application of science within CBDA, including how scientific reviews are organized and how recommendations are used.

**Commentary:** Forward-looking comment in the form of a short communication.

**Original Approach:** Original ideas and suggestions developed by the ISB regarding emerging or overarching scientific or technical issues.

**Briefing:** Presentation and other information provided to the ISB regarding pertinent scientific and technical issues and activities.

### ISB Subcommittee and Task Force Membership

Work Plan Topic	ISB Members															
	Adams	Cummins	Dunne	Freyberg	Glaze	Ingram	Keller	Luoma	Melack	Meyer	Mount	North	Patten	Reed	Rose	Twiss
<b>Delta Improvements Package</b>																
Appraise sources of information										X			X			
Develop Research Questions				X				X								
Work with CWEMF									X						X	
<b>ISB Review of Science Agenda</b>																
Research					X					X						
Information Transfer	X															X
<b>System Monitoring and Data Assimilation</b>																
Salt management in San Joaquin								X				X				
Operation of South Delta Barriers				X							X					
Assessing Science Needs	X													X		
Integrated Use of Environmental Water	X	X		X		X							X		X	
<b>ISB Annual Report</b>																
Levees	X			X		X	X				X	X		X		
Performance Measures		X				X	X			X		X				X
X – Shade denotes lead investigator or subcommittee chair/co-chair.																

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## **Meeting Summary, February 22, 2005**

### *ISB Members in attendance*

Richard Adams, Ph.D.	Ken Cummins, Ph.D.	Tom Dunne, Ph.D.
David Freyberg, Ph.D.	Bill Glaze, Ph.D.	Helen Ingram, Ph.D.
Jack Keller, Ph.D.	Sam Luoma, Ph.D.	John Melack, Ph.D.
Judy Meyer, Ph.D.	Jeff Mount, Ph.D.	Warner North, Ph.D.
Duncan Patten, Ph.D.	Denise Reed, Ph.D.	Bob Twiss, Ph.D. (phone)

### *ISB Members not in attendance*

Kenneth Rose, Ph.D.

### *CBDA Staff*

Dan Castleberry	Zach Hymanson	Johnnie Moore, Ph.D.
Tim Ramirez	Rhonda Reed, Ph.D.	Patrick Wright

### *Support Staff*

Bruce DiGennaro	Kateri Harrison	Jeff Nield
Diana Roberts	Elizabeth Soderstrom, Ph.D.	Kamber Zielke

Meeting convened 8:35 a.m.

## **General Business and Membership**

- Jeff Koseff has resigned from the ISB.
- The Authority approved two new members to the ISB: Warner North and Richard Adams.
- Moore hopes to nominate a new ISB member to replace Jeff Koseff by the April Authority meeting so that the person can attend at the May ISB meeting. He also is working on a nomination for a fish ecologist.
- A request was made for a new ISB member from a business school or sociology department, with experience with organizations, organizational change, and networks among organizations. CALFED has made and continues to make fundamental differences in how agencies interact with each other. The ISB should be in a position to evaluate this. Moore requested a stronger and more detailed description of why this discipline is needed on the ISB in order to justify it to the Authority.

Action Item: Ingram and North agreed to prepare background materials for presentation to the ISB at the May meeting on the need for additional disciplines on the ISB as noted above.

- The November 2004 ISB Meeting summary was approved, noting one correction and one stylistic comment. Melack was present at the November 2004 ISB meeting. Footnotes should be reduced in future summaries.
- A brief *Key Outcomes* memorandum will be produced after each Science Board meeting and shared with the other Boards as a mechanism for improving communications between the ISB, Water Management Science Board (WMSB) and the Ecosystem Restoration Program Science Board (ERPSB).

Action Item: ISB members were asked to review the first few Key Outcomes memos carefully and provide feedback to the staff on whether it is clear from these memos what the other Boards are doing. (All)

## ISB Member Disclosures

ISB member disclosures are posted on the ISB website. Updates to these disclosures were provided by specific members. Adams is doing research with USFWS on habitat designations, a number of which are in California. He is a consultant to NOAA on issues related to critical habitat. North noted that he has a bias in favor of public participation and good use of science. He has done a lot of work for industry, particularly related to energy issues. A former colleague was active some time ago in determining operation rules for dams that feed into the Delta. Cummins noted that Humboldt State University was named as the managing agency for a proposal submitted in response to a PSP. He would be only peripherally involved.

## Science Program Update

### *Staffing*

Zach Hymanson is the new Science Program Manager. The Science Program (SP) is advertising for two new staff scientist positions at the Master's degree level or higher, and hopes to have offered the positions by the end of March. A biologist to work with water operations is particularly desired.

Approximately seven post-doc and research assistantships in a range of disciplines will be filled for September appointment. The call for applications will be out in April or May 2005. A range of disciplinary expertise will be represented.

### *2004 Science Program PSP*

\$18 million, all from California state funding sources, is available to fund projects under the Science Program's PSP. Three broad topics covered by this PSP are (1) water operations and specific biological resources, (2) ecosystem processes and their relationship to water management and key species (understanding ecosystem processes at a fundamental level), and (3) performance assessment.

A total of 141 proposals were submitted, requesting a total of \$142 million. More than 50 proposals were designated as collaborative; the Bay-Delta Science Consortium will review them to determine how collaborative they actually are. One hundred seventy-eight institutions were represented.

Proposals cover the following topics: water management models, Delta water quality, implications of future change, diversion and key species, salmonids, Delta smelt, waterfowl, invasive species, mercury, sediment, levees, and subsidence. A report that matches proposals to the Science Program's mission and interests is currently in development.

- Proposals are currently in External Scientific Review of the review process, as shown below.

Proposals => Administrative Review => External/Scientific Review => Technical Synthesis Panel (including Bay-Delta Science Consortium Review) => Selection Panel => Public Review and Comment => Selection Panel => Funding Recommendations to the California Bay-Delta Authority.

- The Lead Scientist hopes to submit proposals for approval to the Authority in September 2005.
- Six hundred reviewers, many of national or world-class reputation, are involved in External Scientific Review. Their exposure to the CBDA and the Science Program might encourage more world-class scientists to be involved in CALFED activities in the future. The Technical Synthesis Panel, with a membership of 15, including five ISB members, will meet at the end of March. The public review and comment process is intended to give stakeholders the opportunity to be involved in decision-making and to allow stakeholders and the public to bring up concerns.

## Discussion

It was suggested that unfunded proposals be shared with other programs. This would recycle the tremendous effort involved in evaluating the proposals. It might also have the advantage of helping some of the other programs develop an understanding for how science can be useful. Luoma offered his assistance to the Lead Scientist to develop this possibility. Funding for accepted proposals will be through contracts via various state agencies. It is likely to take up to two years for recipients to receive their funding and begin work. It was noted that the delay is a significant impediment to scientific progress.

It was noted that there are two types of proposals, for implementation projects and for research. The current funding process is adequate for funding implementation projects. A new process for research should be developed. Reviewing science proposals and reviewing implementation proposals are very different activities. Considerations included the following:

- Research proposals submitted to other programs should perhaps be routed to the Science Program. The timing issue of PSPs will likely prevent this now.
- PSPs often deal with the short-term science agenda. The current PSP process might not support the ISB and the SP in encouraging investigations with a longer view.

Action Item: The ISB agreed to form a team (Reed, Adams) to consider the issues noted above and draft recommendations that could be submitted to the Authority, timed to coincide with approval of proposals.

### *Development of Science Agenda*

The Science Agenda is in development and expected to be finalized in January 2006. A draft process for developing the Science Agenda was distributed to the ISB by the Lead Scientist. Representatives from the ISB, ERPSB and WMSB, BDPAC, and the CALFED Agency Coordination Team, and outside experts will be involved in the review. Public review will likely be in fall 2005, with presentation to the Authority at the December 2005 meeting. The Lead Scientist and the ISB view the Science Agenda as a broad vision, but many others believe it should lay out specific issues and questions to address.

The ISB suggested that the Lead Scientist consider two distinct aspects in developing the Science Agenda: 1) original work, or *research*, and 2) efforts to communicate science findings, or *information transfer*. The ISB also identified the need to consider strategies for the ISB and the Science Agenda to get beyond a short-term perspective and to consider some of the broader, longer-term issues facing the program. The ISB agreed to plan for a more substantive discussion of this issue at the May meeting.

Triggered by the Lead Scientist's summary of the Science Program PSP, the ISB offered the following observations regarding the use of PSPs for addressing science needs:

- State contracting process have a detrimental effect on the Program's ability to mobilize scientific studies in a timely manner to respond to the needs of management agencies.
- Relevant and promising, but unfunded proposals from the Science Program PSP might be shared with other CALFED programs.

Are there different approaches the Science Program might consider, beyond the PSP process, for funding science activities?

#### Action Items:

- Two teams of ISB members were appointed by Dunne to assist the Lead Scientist in developing aspects of the agenda: (1) information transfer (Twiss, Adams) and (2) research (Glaze, Meyer).

- All ISB members should review the draft process for developing the Science Agenda and provide any comments to the Lead Scientist.

## **Director's Update**

The joint December 2004 meeting of the Authority and BDPAC was well received. The 24 Authority members, composed of agency members, legislative appointees, and members of the public, felt it was valuable to see debate in person rather than filtered through a staff report. Members of BDPAC representing approximately 30 stakeholder groups were glad to have direct access to the Authority. They might continue joint meetings. The morning of the joint February 2005 meeting was focused on science and biology. There was considerable discussion about performance of EWA (prompted by a presentation from the EWA Technical Review Panel by Kenny Rose).

The Authority values the ISB's input highly. They hope to continue receiving regular updates from the ISB and the Lead Scientist. Wright suggested the ISB consider carefully how to communicate science, contracting, and other issues to the Authority. The Authority's top concerns for 2005 are finances, water measurement, and the Delta. The Delta is discussed in more detail under *DIP History and Policy Perspective* below.

### *Finances*

CALFED programs have seen a huge shift in funding from the General Fund to bonds. Bonds are nearly drawn down. Seeking new sources of funding is a priority. Possibilities include:

- Federal funds. The President's budget included an increase for CBDA.
- User fees. These may range from diversion fees to storage fees.
- Other fees. This may include a retail surcharge or a surcharge for households.

### *Measurement*

Stakeholder perception is that water is not measured accurately, particularly for agriculture. Controversial issues include location of measurement (diversion and distribution points), net groundwater usage, evapotranspiration, and runoff. The current approach focuses on collecting existing measurement data rather than doing new measurement.

## **Monitoring Team Report (Glaze, Meyer)**

- The *Monitoring Team Progress Report* was delivered to the ISB as part of the meeting binder.
- The SFEI database of monitoring programs dates from the 1990s. It contains information on 600+ monitoring programs, but the data are incomplete. For instance, fewer than twenty contain budget information. It is not a useful tool to assess the current state of monitoring.
- Existing databases of monitoring data are often not compatible.

### *Initial Recommendations*

- The Monitoring Team recommends that the ISB consider sponsoring a workshop on monitoring, continuing the progress made by Comprehensive Monitoring Assessment and Research Program (CMARP) and Terrestrial and Amphibian Monitoring Program (TAMP) workshops. Ideally, a workshop would focus on a performance measure and identify monitoring needs. Alternatively, a workshop could focus on improving coordination for monitoring in a limited geographic area.
- A task force to develop an "Observation and Forecasting" or "Data Assimilation" System for the Bay-Delta region, including the San Joaquin River area and utility users, could help in assessing CALFED program performance.
- The recommended charge and composition for the above noted force are described in the draft *Charge to a Task Force to Design a Comprehensive Observation & Forecasting System for the California Bay-Delta System* in the meeting packet. The task force would describe (1) a proposed

network of monitoring stations; (2) a real-time data management system; (3) a real-time data assimilation, interpolation, and forecasting system; (4) methods for communication of the database, models, and modeling products to the general public; and (5) an estimate of the cost of such a system. It should address the need to improve interrelating data on multiple time scales.

- The proposed task force would not develop the product, but rather it would describe an overarching view of how to coordinate individual data points. For instance, IEP is a valuable repository of a huge dataset; the task force would develop a plan to use such data in a data assimilation system.

## **Discussion**

Any such data assimilation system should be carefully developed to address the following:

1. Will the system add value and how will CBDA assure people (e.g., users, managers, scientists, public) will be satisfied with the system?
2. Current tools for decision-making might be perceived as adequate, so the added value and/or necessity of a more advanced system might not be obvious,
3. The system could easily appear too complicated and access to information and analysis might be too slow.
4. A technical panel would be able to demonstrate to agency managers the system's potential usefulness. By including managers on the panel it would help ensure that the system addresses needs. Development of the system and development of involvement with agencies should be parallel.
5. The product of the task force could be too broad to be useful. Considering specific questions or tractable variables would help the group focus its efforts.

A public workshop would be a useful tool for discovering the range of points of view. It was suggested that the proposed task force have a broader scope than the one proposed, to include performance measures and possibly modeling.

Two kinds of decisions exist that a data assimilation system might deal with: (1) real-time operational decisions and (2) projections—what future consequences a specific action will have. It was suggested that the emphasis of the proposed task force be on real-time management and real-time data assimilation. The system would make explicit the decisions that are already being made now, adding a great deal of transparency to the process. The overall approach to monitoring should be guided by performance measures.

- It was suggested that a task force (perhaps the proposed task force) could make a large contribution by considering whether existing monitoring addresses existing questions. A workshop rather than the task force should develop the questions.
- It was suggested that the proposed task force might benefit from combining issues from both monitoring and modeling: assimilating data in a modeling context. Modeling and monitoring workshops should be held separately.

## **Next Steps**

- The May ISB meeting should include a working session to focus on questions (to be selected) on monitoring, possibly as background for the proposed workshop, possibly as seed questions for the proposed task force. The questions should focus on how the system works and whether CALFED is making a difference rather than on operational issues.
- Working session invitees could include USGS NAWQA representatives, critical agency experts, stakeholders, and a representative of either Baptista's group or a similar one. Randy Brown might help organize the discussion. The purpose will be to elicit information from experts, including such questions as "What do you have in the way of flow data?" "... of fish data?"

- DIP could serve as an example to demonstrate the usefulness of a data assimilation system. The DIP documentation notes that a monitoring program will be included.
- Recommendations to the Authority on a task force and on a possible data assimilation system can be made after the working session. If the ISB decides to recommend subsequent workshops and/or a task force, it should justify the idea directly to the Authority to get their perspective and buy-in before proceeding, to help assure agency involvement and interest.

### **Delta Improvements Package**

ISB discussion about DIP touched upon the need for science to have a “systems perspective” that considers the integration of multiple scientific disciplines and perspectives. Future investigations should look at long-term risks and challenges associated with DIP actions, including landscape-scale processes that might affect levee stability, water quality (other than salinity and total organic carbon), urbanization, and climate change. The ISB will identify and appraise sources of information relative to the DIP (as outlined in its 2005 Work Plan) once the environmental documents for the DIP have been released.

The discussion was structured around DIP Overview, DIP History and Policy Perspective, and Planned Science Program Activities Related to DIP.

#### *DIP Overview (Reed)*

- The Delta Improvements Package (DIP) proposes increasing water-pumping capacity to 8500 cfs. The hypothesis underlying DIP is that increased pumping will result in an increase in flexibility in water operations (*8500 hypothesis*). Conditions on 8500 cfs for full implementation include water quality requirements, regulatory species protection, sufficient water supply for agriculture, and long-term EWA.

- DIP supports and seeks balance among the following components:

*Water Supply Reliability* - Water supply reliability focuses on integrating state and federal water projects by constructing a physical connection between them (the intertie). It is assumed that the intertie will increase both pumping capacity and flexibility. For example, if protected fish are near the state pump, pumping can be moved to the federal pump.

*Ecosystem Restoration* - DIP promises that (1) the ROD will be re-visited in light of new regulatory commitments, (2) a comprehensive evaluation of effects of water operations on listed species will be done, and (3) Implementation Plans will be prepared. It also assumes operation of long-term EWA. CALFED through ERP has made significant investments in restoration in the region, including \$35 million toward the purchase of Staten Island, the Dutch Slough restoration effort, and projects supporting wildlife-friendly agriculture. Other areas in this region provide excellent opportunities for restoration, including Yolo Bypass, Liberty Island, and the Consumnes.

*Water Quality* - The crux of the South Delta issues is water quality. Temporary barriers are erected annually in the South Delta, San Joaquin River area, Antioch, Stockton, and Sacramento River area to protect water quality, including salinity and DO levels. Some barriers also protect seasonal fish runs. Specific agreements under DIP are designed to safeguard water quality, including agreements to guarantee water levels, to re-pump water into the San Joaquin River when needed to dilute salinity, and to manage upstream saline loading. Causes of high salinity include agricultural

run-off, salinity intrusions from Frank's Tract, tidal intrusion, and reduced fresh water flow. Pumping will assure that agricultural diversions remain viable and that salinity levels in the San Joaquin River are acceptable. Levee failure is a potential threat to salinity levels. DIP assumes that the Multi-Year Program Plan for levee system integrity will be implemented. Whether the funds will be available and whether plans are sufficient to protect water quality is not clear.

*Science* - Science is needed to address the following issues:

- The impacts, including benefits, of salinity variation; effects of water management on biological resources; ecosystem restoration options in the DIP context; and uncertainties.
- Population biology of key species. What benefit to populations of key species has resulted from habitat restoration in the north and what benefit is anticipated? Will benefits in the north offset the cost of possible population impacts in the south? DRERIP is designed to prioritize the programs so that it's clear what ERP plans to do in the Delta. Timelines are parallel. Scientific teams are developing conceptual models to evaluate projects.
  - Impacts of converting Delta islands to fresh-water reservoirs. This action is not mentioned in the package but is being considered.
  - Evaluation of VAMP, X2.
  - Evaluation of fish facility improvements and fish salvage operations.
  - Development of performance measures.
  - Impact of climate change and sea level rise.
  - Impact of urban encroachment that is not under CALFED control, such as the "Big Break" development near Antioch at the western edge of the Delta.
  - Potential benefits and drawbacks of a Delta Cross-Channel Through-Delta Facility.
- Cumulative effects of proposed DIP actions associated with these issues must be considered, as well as how to assess them and how to monitor after implementation.
- Science is also needed to study fundamental uncertainties in system performance. The weakest link must be identified and its potential effects; for instance, what would be the effect of a catastrophic levee failure? Of a more limited levee failure?
- Finally, how much high-quality, quantitative information is available on these issues, in particular water quality and ecosystem restoration? Are conceptual models for the relationships available?

#### *DIP History and Policy Perspective (Wright)*

DIP evolved with changing science and changing water demands. Under the DIP umbrella is the South Delta Improvements Package's action to increase state water project pumping to 8500 cfs. However, DIP is much more than this one isolated issue; it is a collection of programs, projects, and evaluations focused on the Delta region to advance CalFed goals.

Northern California provides fresh water to southern California. During periods of high flow, water is exported directly from northern California freshwater sources. During periods of low flow, however, the water is augmented with water pumped from the Delta through the Delta Cross-Channel. This pumping can draw saline water from the Bay, impairing water quality and disrupting fish migration.

Until 1995, management strategies focused on cross-channel operations, limiting outflow, and manipulating pumping. In 1995, three alternatives were considered to deal with this problem:

- Alternative 1: do a better job managing exports in the South Delta.
- Alternative 2: focus on the through-Delta system, easing the path from north to south.
- Alternative 3: build a Peripheral Canal “Open Channel Isolated Facility” around the Delta.

Analysis suggested that Alternative 3 would yield better water quality and protection for fish. Special interests, however, did not like the Peripheral Canal and Alternatives 1 and 2 had acceptable performance, so Alternative 3 was rejected at that time and Alternative 2 was chosen.

Studies have shown that for many species in this system, the greater the outflow, the higher the biological abundance. The hydrograph for the San Joaquin River flow at Vernalis has changed dramatically from earlier unimpaired flow. There is very little inflow into the San Joaquin now, and most is agricultural runoff with high salinity. Various interests find the impaired flow of the San Joaquin problematic, so the South Delta Improvements Package salinity control plan was developed, as a prerequisite for increased pumping to 8500 cfs, which was authorized under the earlier agreement

South Delta Improvements Package does not take into account the following problems:

- Assumption in DIP that the levee system is static. However, evidence increasingly suggests that levee integrity is seriously compromised.
- Other actions that are not coordinated with CALFED and agencies are taking place on the Delta (such as local development projects).

Making Alternative 2 work required and continues to require a package of actions to support ecosystem restoration, species populations, water quality, water management, and levee integrity. Measures include temporary barriers (see *DIP Water Quality* above) and closing and opening the cross-channel gate. Even with these measures, the X2 line has shifted west.

Because of salinity intrusion, the lack of integrity of the levee system, and other causes, some people believe that Alternative 2 is not workable. The CALFED ROD requires that the alternatives be revisited seven years from the time the ROD was completed. Alternative 3 would address the water quality of Delta exports. The environmental perspective is that increased exports, regardless of how they are accomplished, will increase the stress on the already-stressed Bay-Delta system.

#### *Planned Science Program Activities **Related to DIP** (Moore)*

Specific sections of the DIP Implementation Plan are relevant to the Science Program:

Section A. The ISB will continue to provide input to the CBDA on implementation of the Delta Improvements Package Implementation Plan regarding long-term risks and challenges.

Section B. The Science Program, in cooperation with the management agencies, will complete a comprehensive review of the first 4 years of the EWA.

Section E. The Science Program’s 2004 PSP (in process) anticipates approximately \$15-20 million will be available for directed research to address specific needs (provided funds are available).

Section F. SWRCB Periodic Review: No plans at this time for this action.

Page 7, Paragraph VI. The state and federal agencies will continue to conduct workshops, studies, independent reviews, and other activities to evaluate the relationship between the

SWP/CVP operations, water quality, and biological resources, and to incorporate the best available information into their planning and regulatory activities.

The Science Program has planned or proposed the following workshops for 2005:

- Central Valley salmonid escapement monitoring (technical issues of salmonid surveys).
- Delta Action 8 salmon survival studies (water pumping and survival of juvenile Chinook salmon). April 2005. Randy Brown leading.
- Seminar on the use of Passive Integrated Transponder tags (monitoring method for salmon). Randy Brown leading. This workshop was spawned by the EWA Technical Review Panel.
- Salmon and Smelt workshop (summarize the latest knowledge of salmon and smelt in the rivers and Delta).
- Smelt working session following the release of the Delta smelt whitepaper.
- Predation of DS and salmons at the Delta pump intakes to the SWP and CVP.

The Science Program has planned or proposed the following research papers for sponsorship in 2005:

- Salmonid white paper, John Williams, NMFS Northwest Fisheries Science Center (in review).
- Delta smelt white paper, Bill Bennett, UC Davis (in review).
- Chinook life history journal paper, Wim Kimmerer, SFSU Tiburon Center and Randy Brown, DWR retired (in preparation).
- EWA Overview journal paper, Larry Brown, USGS and others (in preparation).
- Delta smelt, pumping and temperature journal paper, Zach Hymanson, CBDA Science Program and others (in preparation).

The Science Program will also reconstitute the EWA Technical Review Panel of EWA for its three-year extension. Concern was expressed that if a “seal of approval” is put on EWA, this approval might be used to support DIP. This year’s technical review of EWA suggested that the science does not show that EWA supports fish.

### **Water Supply Team Report (Luoma, Freyberg)**

The ISB Water Supply Team submitted a draft memorandum to the ISB, recommending possible research questions related to the DIP that might be investigated by the Water Management Science Board (WMSB), ISB, agencies, or other interested parties. The Water Supply Team developed nine broad issues that should be considered from a science perspective.

1. Scope, which should include both upstream and Delta effects.
  2. Need for assessment of historical, current, and future conditions throughout the watershed and clarify the state of knowledge. For instance, because reservoirs will have increased diversions, operations will be different.
  3. Seasonality.
  4. Water conservation.
  5. Opportunities for conducting experiments (particularly adaptive management).
  6. Implications for markets.
  7. Implications of new tech developments, for instance desalination.
  8. Developments at other institutions.
  9. Water supply & reliability.
- The Science Boards’ charge is to make sure that CALFED considers cross-cutting issues. The Water Supply Team intends this document to serve as a record to make sure that these issues are not forgotten, particularly because DIP might be the start of a trend for larger future exports.

- Based on feedback received from the ISB and members of the WMSB (Keller, Melack, Ingram) at the meeting, the memorandum will be revised and submitted to the WMSB. The ISB will work collaboratively with the WMSB as well as the Ecosystem Restoration Program Science Board (ERPSB) to investigate a number of the questions and to explore the scope of issues necessary to fully evaluate changes in water delivery and flow characteristics as they relate to water quality and ecosystem processes.
- The Water Supply Team will refine this memo so that it is available as a resource, perhaps published in the on-line journal. The ISB will collaborate with the other Science Boards to study one or two of these topics in detail.<sup>2</sup> The Science Boards will report the results of the investigation to the Authority.

### **Modeling Team Report (Melack)**

Melack attended the California Water and Environment Modeling Forum (CWEMF) Annual Meeting at Asilomar on March 1-4, 2005 and provided a presentation on the ISB's interest in hosting a modeling workshop in collaboration with CWEMF to explore the use of models for addressing scientific questions related to the DIP.

**Action Item:** ISB member Rose was appointed by Dunne to work with Melack on additional fact finding and planning for a workshop with CWEMF on modeling and the DIP in Fall 2005.

### **Discussion**

- The Bay-Delta system must be considered as a system, so its science should also be system-oriented. That said, understanding of various aspects of the system and associated conceptual models varies considerably with respect to type of science. Physical and hydrologic functioning of the system is fairly well understood. Chemistry is less well understood, and biology has large uncertainties. Where these disciplines interact is where a systems perspective is essential. For instance, integration would consider the interaction of water rights agreements, water quality standards, flow, and fish population numbers.
- The ISB must approach DIP from the perspective of long-term risks and challenges, considering levee stability, water quality including concerns other than salinity and DO, urbanization and human population growth, and sea level rise.
- The ISB needs to become more familiar with science issues to be able to evaluate the science that has been funded, promoted, and distilled for results within CALFED.<sup>3</sup> Some of the science work done within CALFED before existence of the Science Program has left no lasting record. Recent work is published in the online journal. Luoma and Kimmerer developed a summary of the past decade's work for the last OCAP workshop, laying out 12 advances in science and 12 process points. More presentations to the ISB on current science work are needed.

### **Next Steps**

- The Delta Improvements Package's purpose is to improve the Delta. The ISB developed questions about (1) the validity of the hypothesis that increased pumping will also increase flexibility (see *DIP Overview* above), the nine issues raised by the Water Supply Team (see *Water Supply Team Report* above), and levee system integrity.

<sup>2</sup> Adaptive management experimentation in the Delta, collaborating with the ERPSB was one suggestion for collaborative investigation.

<sup>3</sup> The *Science in Action* publication series addresses some of this information.

- The ISB will investigate the accuracy of the 8500 hypothesis using modeling, among other tools. They will collaborate with the WMSB, focusing on salinity and barriers in the South Delta. The modeling exercise will be kept as simple as reasonable by making assumptions and constraining geographic extent and range of input allowed. These questions will also be instructive in determining requirements of a data assimilation system. Note: both a monitoring program and a conceptual model would be needed to guide any data assimilation system.

*Session adjourned 5:00 p.m.*

## **Meeting Summary, Wednesday, February 23, 2005**

### *ISB Members in attendance*

Richard Adams, Ph.D.	Ken Cummins, Ph.D.	Tom Dunne, Ph.D.
David Freyberg, Ph.D.	Bill Glaze, Ph.D.	Helen Ingram, Ph.D.
Jack Keller, Ph.D.	Sam Luoma, Ph.D.	John Melack, Ph.D.
Judy Meyer, Ph.D.	Jeff Mount, Ph.D.	Warner North, Ph.D.
Duncan Patten, Ph.D.	Denise Reed, Ph.D.	

### *ISB Members not in attendance*

Kenneth Rose, Ph.D.	Bob Twiss, Ph.D.
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### *CBDA Staff*

Dan Castleberry	Zach Hymanson	Jana Machula
Johnnie Moore, Ph.D.	Tim Ramirez	Rhonda Reed, Ph.D.
Patrick Wright		

### *Support Staff*

Bruce DiGennaro	Kateri Harrison	Jeff Nield
Diana Roberts	Elizabeth Soderstrom, Ph.D.	Kamber Zielke

Session convened 8:35 a.m.

### **EWA/ERP Integration Subcommittee (Patten)**

The scheduled February 21, 2005 meeting of this subcommittee was canceled due to illness and travel problems. The subcommittee's report, which was to have been discussed at the meeting, will be finalized via conference call before the next ISB meeting. The report will address integration and coordination of environmental water programs. It may also address balance to cover such issues as perceived concern that EWA water is being used to cover shortfalls in b2 water.

### **Levees Subcommittee (Ingram)**

In 2004, Mount and Twiss developed a report on levee integrity resulting from scouting activities requested by the ISB. The Levee Subcommittee's charge is to consider the information in the Mount/Twiss report with respect to cross-cutting issues and to develop recommendations. To this end, a Subcommittee meeting was held January 28, 2005, which attracted a large in-person and call-in audience from public and stakeholder communities.

During the meeting, information relevant to the Subcommittee's report was brought up by audience members. Based on these comments, the Subcommittee decided that more scouting and literature review (perhaps with assistance from the WMSB) is needed before they finalize their recommendations. The Subcommittee will expand its membership to include a wider range of specialties, including risk analysis, economics, and possibly social geography. The Subcommittee will also review levee policies in other CALFED programs.

The Subcommittee will meet before the next ISB meeting to discuss results of these investigations. They anticipate that they will develop a recommendation to the ISB by the May meeting. The recommendation might include an ISB working session devoted to the topic and/or a focused workshop or symposium.

The Subcommittee has developed a draft report that investigates what information exists and what information is generally available on the following topics:

- Risk assessment.
- Cost-benefit issues.
- Emergency and long-term response.
- Targeted research.
- Peer review of existing knowledge and literature.

New questions raised in the January Levees Subcommittee meeting include:

- To what extent are CALFED programs taking into account uncertainties of levee instability?
- What studies are being conducted to evaluate long-term resources to address levee maintenance, repair, and other issues?
- What costs result from levees on agriculture, water quality, fish populations? What are any cultural/human costs with respect to history, tradition, and commitments?
- How would deliberate flooding affect levee integrity and impact cost sharing?

Specific agencies whose work needs further investigation include CALFED's Levee Integrity Program, DWR (especially their Comprehensive Levee Program Evaluation), and possibly the Army Corps of Engineers.

The federally-funded Comprehensive Study from the USACE and the State Reclamation Board studied and made recommendations for multi-objective floodplain management. The study was halted two years ago. It included the San Joaquin and Sacramento River areas, but not the Delta. Much of the Central Valley addressed by this study lies within the 100-year floodplain. Hamilton J levee in Hamilton City was in the study; ERP contributed funds for its feasibility study. The UNET model and the Ecosystems Function Model have been developed as part of these efforts.

As a result of the a \$500 million settlement in the Paterno suit resulting from a levee failure in a floodplain at the confluence of the Yuba, Feather, and Sacramento Rivers, upheld by the California Supreme Court, the State of California appears now to be financially responsible for damages resulting from future levee failure. In the case of a serious flood, given the size of the Paterno settlement and the extent of levees in the Central Valley and Delta<sup>4</sup>, this could be catastrophic for California's financial status.

In response to the above court ruling, DWR developed the document *Flood Warnings: Responding to California's Flood Crisis*. Recommendations include the following (comments provided by Mount);

1. Ensure the integrity of existing flood project infrastructure through improved maintenance programs.  
Comment: The estimated cost to repair the estimated 180 miles of extensively eroded levees is \$600 million. Maintenance cannot be done in some cases because of ESA issues.
2. Evaluate the integrity and capability of existing flood control project facilities and prepare [a] ... rehabilitation plan.  
Comment: Funds do not exist for this evaluation.
3. Improve the effectiveness of emergency response programs.
4. Create a sustainable fund to support flood management programs.  
Comment: Two districts have been created, one for the Sacramento River and one for the San Joaquin River. This lack of unity would have implications. The Delta is not included in these districts.
5. Update floodplain maps and provide better education on flood risk

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<sup>4</sup> There are 6000 miles of levees in the Central Valley, 1100 miles in the Delta.

Comment: The National Flood Insurance Program has no funds to update the maps. Current maps are underspecified because the original survey did not take into account the complexity of floodplains in this three-river area. There would also likely be political concerns.

6. [I]mplement a multi-objective management approach for floodplains

Comment: This is the most germane of the recommendations to CALFED.

7. Evaluate potential policies and procedures.

Beyond these recommendations, DWR has introduced legislation that would examine flood insurance requirements, possibly providing insurance to people who live behind levees, regardless of whether they live on the 100-year floodplain. They have also suggested a constitutional amendment that would release the State from responsibility for damages resulting from levee failure.

The recommendations above do not slow urbanization of floodplains, which increases both risk of levee failure and risk of financial liability.

#### *Public Comments*

Serge Birk, CVPWA, expressed appreciation for the discussion of outreach to stakeholders. He asked how information gained in a workshop/symposium and through other ISB fact-finding activities would be used. Responses included:

1. To assure that interconnections are made among disciplines.
2. To characterize uncertainty and to make that information public.
3. To point out gaps in knowledge or perspective potentially needed for management decisions.

#### **Performance Measures Subcommittee (Cummins)**

The Performance Measures Subcommittee's charge, as developed by the Subcommittee with guidance from program staff, agency representatives, and the public, is to develop a process for developing performance measures for CALFED programs and to pilot test this process.

The subcommittee has developed general guidelines for performance measures as follows:

- Performance measures must be linked to CALFED objectives. This is complicated by the fact that many objectives are not well-defined.
- Focus is on whether an action "made a difference."
- Trends and trajectories are of interest. For instance, in the Everglades, the relative distribution of cattails and sawgrass is an indicator of phosphorus levels. A change in this distribution indicates whether restored wetlands are working. New tools such as GIS might be useful for assessing trends and trajectories.
- Performance measures are intricately connected to modeling and monitoring.
- Timeline for a performance measure must be made explicit.
- Some form of water budgeting must be an overarching consideration, before regionalization.
- Some performance measures should indicate the transparency of CALFED programs.

The development process will include vetting and a decision tree. The vetting process will be informed by the draft DRERIP vetting process which recognizes three types of acceptability: A proposed action might be appropriate for "full implementation," "pilot project," or "research only." One level of acceptability for performance measures might be "needs more data."

The Subcommittee will conduct two pilot studies: (1) on the Water Quality Program to evaluate concrete performance measures with the vetting process and decision tree and (2) on the Science Program to develop performance measures for program interactions, interaction among diverse organizations, the PSP process, the online journal, and other process-oriented measures.

## **Discussion**

Performance measures could evolve rather than be static measures in a framework that does not acknowledge uncertainty. Statistical approaches exist that allow this kind of development. One technique to gather information relevant to a performance measure is to make information available on the internet and allow for both public and expert comment. This will lead to a “peer review” of sorts, encouraging input from sources that may be well informed but not well known.

ERP has identified 100 indicators. A consultant has developed three-page documents including conceptual models for five of these indicators, including the following:

- Spring-run escapement from Butte Creek. Trends show there from the 1960s through 1996, there was no spring run in Butte Creek. Since restoration efforts began, the spring run increased dramatically, suggesting that restoration has “made a difference.”
- Fall run on the restored Tuolumne is increasing. However, trends over time show that these changes reflect the ocean cycle. Restoration on the Tuolumne has not made a difference.

The ERPSB responded that the models needed further development. Despite this review, the ERP has used graphics from the reports and updates them annually. They have been useful.

## **Review Action Items and Next Steps for ISB**

### *2005 Workplan*

See *ISB 2005 Workplan*, attached.

### *ISB Subcommittee and Task Force Membership*

See *ISB Subcommittee and Task Force Membership*, attached.

## **Public Forum Comments**

There were no public comments.

*Meeting adjourned 3:00 p.m.*